

Preliminary Technical Data

ADG721/ADG722/ADG723

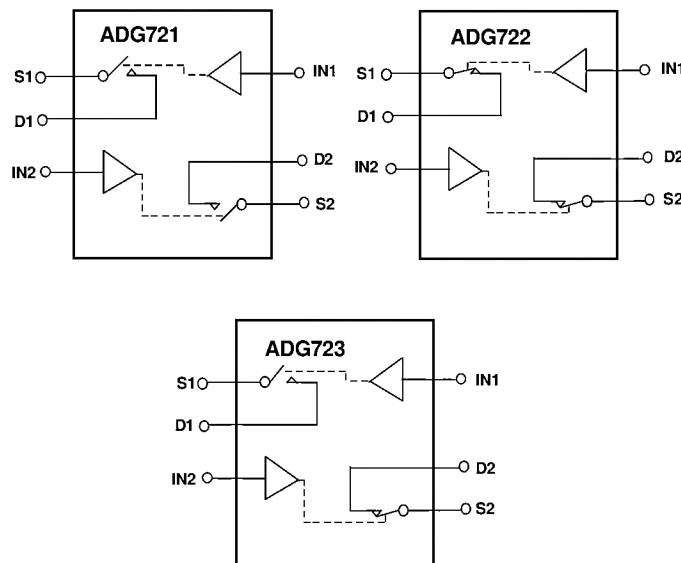
FEATURES

+1.8V to 5.5V Single Supply
 2Ω On Resistance
 Bandwidth 100MHz
 Rail to Rail Operation
 Very Low Distortion
 8-lead μ SOIC Package
 Fast Switching Times
 t_{ON} 20 ns
 t_{OFF} 10 ns
 Low Power Consumption (1μW)
 TTL/CMOS Compatible

APPLICATIONS

Battery Powered Systems
 Communication Systems
 Sample Hold Systems
 Audio Signal Routing
 Mechanical Reed Relay Replacement

FUNCTIONAL BLOCK DIAGRAMS



GENERAL DESCRIPTION

The ADG721, ADG722 and ADG723 are monolithic CMOS SPST switches. These switches are designed on an advanced sub-micron process which provides low power dissipation yet gives high switching speed, low on resistance and low leakage currents.

The ADG721, ADG722 and ADG723 are designed to operate from a single +1.8V to +5.5V supply making them ideal for use in battery powered instruments, and with the new generation of DACs and ADCs from Analog Devices.

The ADG721, ADG722 and ADG723 contain two independent single-pole/single throw (SPST) switches. The ADG721 and ADG722 differ only in that both switches are normally open and normally closed respectively. While in the ADG723, switch 1 is normally open and switch 2 is normally closed.

Each switch of the ADG721, ADG722 and ADG723 conducts equally well in both directions when ON. The ADG723 exhibits break before make switching action.

PRODUCT HIGHLIGHTS

1. +2V/+3V/+5V Single Supply Operation. The ADG721 ADG722 and ADG723 offer high performance, including low on resistance and fast switching times and is fully specified and guaranteed with +2V, +3V and +5V supply rails.
2. Low R_{ON} (2Ω).
3. Bandwidth 100MHz.
4. Low power dissipation.
CMOS construction ensures low power dissipation.
5. Fast T_{ON}/T_{OFF} .
6. 8-lead μ SOIC.

PrelimB. 11/97

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Preliminary Technical Data

ADG721/ADG722/ADG723

ADG721/ADG722/ADG723—SPECIFICATIONS¹

(V_{DD} = 5V ± 10%, GND = 0 V. All specifications -40°C to +85°C, unless otherwise noted.)

| Parameter | B Version -40°C to +25°C +85°C | | Units | Test Conditions/Comments |
|--|--------------------------------------|------------------------|------------------|--|
| | | | | |
| ANALOG SWITCH | | | | |
| Analog Signal Range | | 0 V to V _{DD} | V | V _S = 0V to 5V |
| On-Resistance (R _{ON}) | | 2 | Ω typ | |
| | | 5 | Ω max | |
| On-Resistance Match Between Channels (ΔR _{ON}) | | | Ω typ | |
| | | 1.0 | Ω max | |
| On-Resistance Flatness (R _{FLAT(ON)}) | | | Ω typ | |
| | | 1.0 | Ω max | |
| LEAKAGE CURRENTS | | | | TBD |
| Source OFF Leakage I _S (OFF) | | | nA typ | |
| | | 2.0 | nA max | |
| Drain OFF Leakage I _D (OFF) | | | nA typ | |
| | | 2.0 | nA max | |
| Channel ON Leakage I _D , I _S (ON) | | | nA typ | |
| | | 4.0 | nA max | |
| DIGITAL INPUTS | | | | |
| Input High Voltage, V _{INH} | | 2.4 | V min | V _{IN} = V _{INL} or V _{INH} |
| Input Low Voltage, V _{INL} | | 0.8 | V max | |
| Input Current | | | | |
| I _{INL} or I _{INH} | 0.005 | | μA typ | |
| | | ±0.5 | μA max | |
| DYNAMIC CHARACTERISTICS ² | | | | TBD |
| t _{ON} | | 20 | ns max | |
| t _{OFF} | | 10 | ns max | |
| Break-Before-Make Time Delay, t _D (ADG723 only) | 1 | 1 | ns min | |
| Charge Injection | 10 | | pC typ | |
| Channel-to-Channel Crosstalk | 85 | | dB typ | |
| Bandwidth -3dB | 100 | | MHz typ | |
| Bandwidth ±0.1dB | TBD | | MHz typ | |
| Off Isolation | 80 | | dB typ | |
| C _S (OFF) | TBD | | pF typ | |
| C _D (OFF) | TBD | | pF typ | |
| C _D , C _S (ON) | TBD | | pF typ | |
| POWER REQUIREMENTS | | | | V _{DD} = +5 V Digital Inputs = 0 V or 5 V |
| I _{DD} | 0.0001 | 0.5 | μA typ μA max | |

NOTES

¹Temperature ranges are as follows: B Versions: -40°C to +85°C.

²Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

ADG721/ADG722/ADG723—SPECIFICATIONS¹(V_{DD} = 2.7V to 3.6V, GND = 0 V. All specifications -40°C to +85°C, unless otherwise noted.)

| Parameter | B Version -40°C to | | Units | Test Conditions/Comments |
|---|-----------------------|------------------------|------------------|--|
| | +25°C | +85°C | | |
| ANALOG SWITCH | | | | |
| Analog Signal Range | | 0 V to V _{DD} | V | V _S = 0V to 3V |
| On-Resistance (R _{ON}) | | 2 | Ω typ | |
| | | 8 | Ω max | |
| On-Resistance Match Between Channels (ΔR _{ON}) | | | Ω typ | |
| | | 1.0 | Ω max | |
| On-Resistance Flatness (R _{FLAT(ON)}) | | | Ω typ | |
| | | 2.0 | Ω max | |
| LEAKAGE CURRENTS | | | | TBD |
| Source OFF Leakage I _S (OFF) | | 2.0 | nA typ | |
| | | | nA max | |
| Drain OFF Leakage I _D (OFF) | | 2.0 | nA typ | |
| | | | nA max | |
| Channel ON Leakage I _D , I _S (ON) | | 4.0 | nA typ | |
| | | | nA max | |
| DIGITAL INPUTS | | | | |
| Input High Voltage, V _{INH} | | 2.0 | V min | V _{IN} = V _{INL} or V _{INH} |
| Input Low Voltage, V _{INL} | | 0.4 | V max | |
| Input Current | | | | |
| I _{INL} or I _{INH} | 0.005 | | μA typ | |
| | | ±0.5 | μA max | |
| DYNAMIC CHARACTERISTICS ² | | | | TBD |
| t _{ON} | | 30 | ns max | |
| t _{OFF} | | 15 | ns max | |
| Break-Before-Make Time Delay, t _D (ADG723 only) | 1 | 1 | ns typ | |
| Charge Injection | 10 | | pC typ | |
| Channel-to-Channel Crosstalk | 85 | | dB typ | |
| Bandwidth -3 dB | 110 | | MHz typ | |
| Bandwidth ±0.1 dB | TBD | | MHz typ | |
| Off Isolation | 80 | | dB typ | |
| C _S (OFF) | TBD | | pF typ | |
| C _D (OFF) | TBD | | pF typ | |
| C _D , C _S (ON) | TBD | | pF typ | |
| POWER REQUIREMENTS | | | | V _{DD} = +3 V Digital Inputs = 0 V or 3 V |
| I _{DD} | 0.0001 | 0.5 | μA typ μA max | |

NOTES

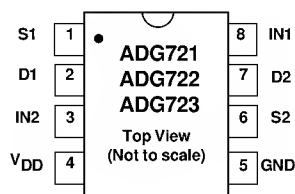
¹Temperature ranges are as follows: B Versions: -40°C to +85°C.²Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

Preliminary Technical Data

ADG721/ADG722/ADG723

PIN CONFIGURATION (MICRO SOIC)



ORDERING GUIDE

| Model ¹ | Temperature Range | Package Option ¹ |
|--------------------|-------------------|-----------------------------|
| ADG721BRM | -40°C to +85°C | RM-8 |
| ADG722BRM | -40°C to +85°C | RM-8 |
| ADG723BRM | -40°C to +85°C | RM-8 |

NOTES

¹RM = microSOIC.

ABSOLUTE MAXIMUM RATINGS¹

(T_A = +25°C unless otherwise noted)

V_{DD} to GND -0.3 V to +7 V

Analog, Digital Inputs² -0.3V to V_{DD} +0.3 V or
30 mA, Whichever Occurs First

(Pulsed at 1 ms, 10% Duty Cycle max)

Operating Temperature Range

Industrial (B Version) -40°C to +85°C

Storage Temperature Range -65°C to +150°C

Junction Temperature +150°C

microSOIC Package, Power Dissipation 450 mW

θ_{JA} Thermal Impedance 206°C/W

θ_{JC} Thermal Impedance 44°C/W

Lead Temperature, Soldering

Vapor Phase (60 sec) +215°C

Infrared (15 sec) +220°C

ESD 2kV

NOTES

¹Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Only one absolute maximum rating may be applied at any one time.

²Overvoltages at IN, S or D will be clamped by internal diodes. Current should be limited to the maximum ratings given.

Truth Table (ADG721/ADG722)

| ADG721 In | ADG722 In | Switch Condition |
|-----------|-----------|------------------|
| 0 | 1 | OFF |
| 1 | 0 | ON |

Truth Table (ADG723)

| Logic | Switch 1 | Switch 2 |
|-------|----------|----------|
| 0 | OFF | ON |
| 1 | ON | OFF |

CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the ADG721, ADG722 and ADG723 feature proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

TERMINOLOGY

| | |
|------------------|--|
| V_{DD} | Most positive power supply potential. |
| GND | Ground (0 V) reference. |
| S | Source terminal. May be an input or output. |
| D | Drain terminal. May be an input or output. |
| IN | Logic control input. |
| R_{ON} | Ohmic resistance between D and S. |
| ΔR_{ON} | On resistance match between any two channels i.e. $R_{ONmax} - R_{ONmin}$. |
| $R_{FLAT(ON)}$ | Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal range. |
| I_S (OFF) | Source leakage current with the switch "OFF." |
| I_D (OFF) | Drain leakage current with the switch "OFF." |
| I_D, I_S (ON) | Channel leakage current with the switch "ON." |
| $V_D (V_S)$ | Analog voltage on terminals D, S. |
| C_S (OFF) | "OFF" switch source capacitance. |
| C_D (OFF) | "OFF" switch drain capacitance. |
| C_D, C_S (ON) | "ON" switch capacitance. |
| t_{ON} | Delay between applying the digital control input and the output switching on. |
| t_{OFF} | Delay between applying the digital control input and the output switching off. |
| t_D | "OFF" time or "ON" time measured between the 90% points of both switches, when switching from one address state to another. (ADG723 only). |
| Crosstalk | A measure of unwanted signal which is coupled through from one channel to another as a result of parasitic capacitance. |
| Off Isolation | A measure of unwanted signal coupling through an "OFF" switch. |
| Charge Injection | A measure of the glitch impulse transferred during switching. |

MECHANICAL INFORMATION

Dimensions are shown in inches and (mm).

8-Lead microSOIC
(RM-8)

